
Research Interests

Physical & computational oceanography, North Atlantic-Arctic connectivity, Ice-ocean interactions, Ocean observing system design, Inverse and adjoint modeling, Uncertainty quantification

Education

- 01/2015 - **University of Bergen**, Bergen, Norway.
- 08/2019 **Ph.D. in Physical Oceanography**
 - Thesis: *Adjoint Modeling and Observing System Design in the Subpolar North Atlantic*
 - Funded by European Research Council project [ice2ice](#)
- 04/2007 - **University of Bonn**, Bonn, Germany.
- 02/2013 **Diploma** (equiv. M.Sc. degree) in **Mathematics, with Honors**
 - Specialization: Stochastic Analysis; Minor: Physics
 - Grade Point Average: 1.0, on a scale from 1.0 (excellent) to 4.0 (pass)

Research Experience

- 10/2018 - **Research Fellow**, *Oden Institute for Computational Engineering and Sciences*, University of Texas at Austin, USA.
 - Develop quantitative and physics-informed methods for ocean observing system design
 - Mentor: Patrick Heimbach
- 1/2015 - **Graduate Researcher**, *Department of Earth Science*, University of Bergen, Norway.
- 06/2018
 - Investigated oceanic teleconnections in the North Atlantic, Nordic Seas, and Arctic Ocean
 - Quantified uncertainties in ocean state estimates for present-day and paleoclimates
 - Advisors: Kerim H. Nisancioglu (University of Bergen), Patrick Heimbach (UT Austin)
- 03/2013 - **Doctoral Research Fellow**, *Department of Mathematics*, ETH Zurich, Switzerland.
- 08/2014
 - Conducted research in the fields of Geometric Analysis and Partial Differential Equations
 - Assisted in teaching undergraduate and graduate level courses

Teaching and Outreach

- 02/2020 **Volunteer**, *Girl Day STEM Festival*, UT Austin.
 - Hands-on science activities and demonstrations for elementary and middle school students
- 03/2013 - **Teaching Assistant**, *Department of Mathematics*, ETH Zurich, Switzerland.
- 08/2014
 - Taught 3 graduate level math courses (*Measure Theory & Integrals*, *Differential Geometry I, II*)
 - *Teaching evaluations*: 4.8 (2013), 4.9 (2014) on a scale from 1 (very bad) to 5 (excellent)
- 07/2013 **Teaching Assistant**, *PCMI Graduate Summer School*, Park City, USA.
 - Taught advanced math course (*Weak immersions of surfaces with L^2 -bounded second fundamental form*, [lecture notes](#)) for Ph.D. students and postdocs
- 10/2008 - **Teaching Assistant**, *Department of Mathematics*, University of Bonn, Germany.
- 02/2013
 - Taught 3 undergraduate level math courses (*Mathematics for Physicists I, Analysis II, III*)
- 01/2010 - **Teaching Assistant**, *Department of Mathematics*, University of Toronto, Canada.
- 04/2010
 - Taught undergraduate level math course (*Linear Algebra*)
- 2009 - 2011 **Student Assistant**, *Hausdorff Center for Mathematics*, University of Bonn, Germany.
 - Organized and led math outreach events for students from elementary and secondary school

Professional Service

Organization of Conferences

- 04/2017 Co-Convener for the session "Quaternary climate archives and proxy uncertainty", EGU General Assembly 2017.
- 09/2015 Co-Organizer of PhD conference "Connecting the ocean, atmosphere and ice sheets", 20 participants, Denmark.

Awards and Scholarships

- 04/2019 **Rising Stars in Computational & Data Sciences**, *Oden Institute for Computational Engineering and Sciences*, University of Texas at Austin, USA.
 - Selected for competitive, international career event for women in Computational & Data Sciences
- 03/2018 **Best Presentation Award**, *Research School on Changing Climates in the Coupled Earth System*, Sommarøy, Norway.
- 02/2016 **Research Grant**, *Norwegian Research School in Climate Dynamics*, NOK 20,000, for research stay at MIT.
- 2013 - 2016 **Scholarships for various summer schools.**
 - IARC Summer School 2016, *University of Fairbanks*
 - ACDC Summer School 2015, *Norwegian Research School in Climate Dynamics*
 - New Directions Short Course IMA 2015, *University of Minnesota*
 - PCMI Summer School 2013, *Institute for Advanced Study, Princeton*
- 02/2013 **Award "Diploma with Honors"**, *Department of Mathematics, University of Bonn*, for graduating with highest possible grade point average.
- 2009/10 **Scholarship for Study Abroad Program (University of Toronto)**, *University of Bonn*.
- 2008 - 2012 **German Academic Scholarship Foundation Award**, *Studienstiftung des deutschen Volkes*, for outstanding academic achievements (given to 0.5% of students in Germany).
- 2006 **3 Awards**, for exceptional results in high-school final exams on state-wide basis.
 - *Porsche AG*: for excellent performance in mathematics and physics
 - *German Physical Society*: for excellent performance in physics
 - *Reinhold Beitlich Foundation*: for exceptional overall performance

Publications

Journal Articles

- J1 Y. Fujii, E. Rémy, H. Zuo, P. Oke, G. Halliwell, F. Gasparin, M. Benkiran, **N. Loose**, J. Cummings, J. Xie, Y. Xue, S. Masuda, G.C. Smith, M. Balmaseda, C. Germaineaud, D.J. Lea, G. Larnicol, L. Bertino, A. Bonaduce, P. Brasseur, C. Donlon, P. Heimbach, Y. Kim, V. Kourafalou, P-Y. Le Traon, M. Martin, S. Paturi, B. Tranchant and N. Usui. Observing System Evaluation Based on Ocean Data Assimilation and Prediction Systems: On-Going Challenges and a Future Vision for Designing and Supporting Ocean Observational Networks, *Front. Mar. Sci.* 6:417, 2019. doi: [10.3389/fmars.2019.00417](https://doi.org/10.3389/fmars.2019.00417).

Preprints

- P1 **N. Loose**, P. Heimbach, H. Pillar and K.H. Nisancioglu. Quantifying Dynamical Proxy Potential through Oceanic Teleconnections in the North Atlantic. Preprint: doi: [10.1002/es-soar.10502065.1](https://doi.org/10.1002/es-soar.10502065.1)

In Preparation

- P2 **N. Loose** and P. Heimbach. Physics-driven Design of Observing Systems via Uncertainty Quantification in Ocean State Estimation, *planned submission: April 2020*
- P3 **N. Loose**, P. Heimbach, H. Pillar and K.H. Nisancioglu. The Dynamical Proxy Potential of the OSNAP Array, *planned submission: May 2020*
- P4 **N. Loose**, H. Pillar, M. Årthun, K.H. Nisancioglu and P. Heimbach. Remote Drivers of Nordic Seas Heat Content Anomalies and Climate Predictability, *in prep.*
- P5 **N. Loose**, K.H. Nisancioglu and P. Heimbach. Ocean Heat Supply to Greenland's Margins: Sensitivity to far field ocean changes, *in prep.*

Thesis

- T1 **N. Loose**. Adjoint Modeling and Observing System Design in the Subpolar North Atlantic, *Ph.D. Dissertation*, University of Bergen, 2019

Presentations

Invited Talks

- 03/2020 **SIAM Conference on Uncertainty Quantification**, *Munich, Germany*, conference cancelled due to COVID-19.
- 02/2020 **Ocean Sciences Meeting 2020**, *San Diego, USA*.
- 04/2018 **EGU General Assembly 2018 (solicited)**, *Vienna, Austria*.
- 03/2018 **University of Edinburgh**, *Edinburgh, UK*.
- 03/2018 **Northumbria University**, *Newcastle, UK*.

Selected Conference Presentations

- 10/2018 **Estimating the Circulation and Climate of the Ocean (ECCO) Meeting**, *Austin, USA*.
- 07/2018 **Workshop on Sensitivity Analysis and Data Assimilation in Meteorology and Oceanography**, *Aveiro, Portugal*.
- 06/2018 **Adjoint (TACOMA) Workshop**, *Oxford, UK*.

Posters

- 06/2017 **Data Assimilation Workshop**, *Bergen, Norway*.
- 05/2017 **Past Global Changes (PAGES) Workshop**, *Louvain-la-Neuve, Belgium*.
- 04/2017 **EGU General Assembly 2017**, *Vienna, Austria*.
- 03/2017 **Workshop on Emerging Applications of Data Assimilation in the Geosciences**, *Leiden, Netherlands*.
- 12/2016 **AGU Fall Meeting 2016**, *San Francisco, USA*.

Selected Courses

Oceanography & Modeling

- Fall 2016 **Introduction to Ocean Modeling**, *Instructor: Patrick Heimbach*, UT Austin, USA.
Conservations laws, approximations, discretization, parameterization schemes, adjoint modeling.
- 02/2016 **Large Scale Turbulence in Atmosphere and Ocean**, *Instructor: Joe Lacasce*, University of Oslo, Norway.
2D turbulence, 3D turbulence, geostrophic turbulence, turbulent diffusion.

11/2015 **HPC Course**, University of Bergen, Norway.

High-Performance Computing (HPC), MPI and OpenMP programming, build systems, revision systems, debugging.

Spring 2015 **Numerical Modeling**, University of Bergen, Norway.

Finite difference methods, explicit and implicit schemes, staggered grids and time steps, stability analyses, relaxation methods for boundary value problems, flux limiter and TVD schemes.

Data Assimilation & Uncertainty Quantification

Fall 2017 **Computational methods for inverse problems**, *Instructor: Omar Ghattas*, UT Austin, USA.

Theory and numerical solution of PDE-constrained inverse problems.

06/2017 **Crash Course on Data Assimilation - Theoretical foundations and advanced applications with focus on ensemble methods**, NERSC, Bergen, Norway.

EnKF, data assimilation for climate prediction and chaotic dynamics, model error, particle filters.

06/2015 **Introduction to Uncertainty Quantification**, *Instructors: Youssef Marzouk, Luis Tenorio*, Institute for Mathematics and its Applications, University of Minnesota, USA.

Bayesian statistics, uncertainty quantification, model validation, model reduction, MCMC methods.

Mathematics

2009 **Stochastic Processes**, University of Bonn, Germany.

Gaussian processes, Markov processes, Gibbs measures, Random walks, Brownian motion.

2010/11 **Stochastic Analysis**, University of Bonn, Germany.

Martingales, Stochastic integrations, Ito calculus, Stochastic differential equations.

Field Work

07/2017 - **East Greenland Ice-Core Project (EastGRIP)**, *Greenland*.

08/2017 ○ Drilled shallow ice cores, conducted surface measurements and lab work in the science trench

08/2016 - **G.O. Sars**, *Irminger Sea*.

09/2016 ○ Collected physical oceanographic data and marine sediment cores for the [ice2ice](#) project (ERC)

Skills

Programming

○ Python, MATLAB, Fortran, Unix/Linux, Git, \LaTeX .

Languages

○ *Fluent in:* German, English, Norwegian; *Basic knowledge in:* Spanish, Italian.